

Alexandru Gica

Congruences Modulo the Square of a Prime for Sums Containing Fibonacci Numbers,

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Abstract

Let $p > 5$ be a prime number and let $U = \sum_{k=2}^{p-1} \frac{(-1)^k F_{k-1}}{k}$, $V = \sum_{k=2}^p \frac{(-1)^k F_k}{k-1}$. The aim of this paper is to prove that $U \equiv 0 \pmod{p^2}$, $V \equiv \frac{L_p-1}{p} \pmod{p^2}$ if $p \equiv 1, 4 \pmod{5}$ and $U \equiv \frac{1-L_p}{p} \pmod{p^2}$, $V \equiv 0 \pmod{p^2}$ in the case $p \equiv 2, 3 \pmod{5}$. We also find similar results for some general Lucas sequences.